

AMENDMENTS TO THE CLAIMS

Claim 1 (currently amended): A compressed data structure suited for segmentation storing of a plurality of samples of compressed waveform data, segmented into a plurality of frames, ~~and subsequent storage of the frames~~ into a memory, the memory being capable of storing n bits per address,

wherein a number of bits per sample of the compressed waveform data is variable between the frames, but uniform within each of the frames,

each of the frames ~~has a same data storage size~~ of the compressed waveform data is stored over a predetermined number j of successive addresses of said memory, and

each of the frames includes, in a predetermined layout, an auxiliary information area for storing auxiliary information that includes compression-related information to be used for decompressing the compressed waveform data, and a data area for storing a plurality of samples of the compressed waveform data of the frame, ~~each of the samples in the frame comprising a same number of bits~~ wherein said compression-related information includes number-of-bits information indicative of said number of bits per sample within the corresponding one of the frames.

Claim 2 (currently amended): A compressed data structure as claimed in claim 1 wherein ~~a data storage area of each of the frames comprises a plurality of addresses regions of a fixed size, and~~ said data area ranges over a plurality of addresses in the j successive addresses, and the data area region in each of said plurality of addresses compactly stores a plurality of samples of the compressed waveform data ~~in each of the address regions.~~

Claim 3 (currently amended): A ~~storage device~~ memory storing compressed waveform data of a plurality of frames having a compressed data structure as defined in claim 1.

Claim 4 (currently amended): A tone generation apparatus comprising:

a memory as defined in claim 3;

~~a storage section that stores a plurality of samples of compressed waveform data segmented into a plurality of frames, wherein a number of bits per sample of the compressed waveform data is variable between the frames, but uniform within each of the frames, each of the frames has a same data storage size, and each of the frames includes, in a predetermined layout, an auxiliary information area for storing auxiliary information that includes compression related information to be used for decompressing the compressed waveform data, and a data area for storing a plurality of samples of the compressed waveform data of the frame, each of the samples comprising a same number of bits;~~

~~a number of bits designation section that designates the number of bits per sample of the compressed waveform data for each of the frames stored in said storage section;~~

an address generation section that generates, every sampling cycle, a readout address varying at a predetermined rate corresponding to a designated tone pitch;

a readout section that designates, on the basis of said readout address, any one of the frames to be read out and reads out stored data of the designated frame from said storage section memory address by address;

[[a]] an auxiliary information retrieval section that, of the data of the frame read out by said readout section, retrieves the auxiliary information from the auxiliary information area; and

a compressed waveform data retrieval section that, of the data of the frame read out by said readout section, retrieves the samples of the compressed waveform data from the data area in accordance with the number of bits per sample designated by said number-of-bits designation section information included in the auxiliary information retrieved by said auxiliary information retrieval section;

a decoding section that decompresses each of the samples of the compressed waveform data retrieved by said compressed waveform data retrieval section; using the compression related information included in the auxiliary information retrieved by said retrieval section; and

a tone generation section that generates a tone on the basis of the waveform data decompressed by said decoding section.

Claim 5 (canceled)

Claim 6 (currently amended): A waveform storage processing apparatus comprising:
a compression processing section that compresses a plurality of samples of waveform data;
a framing section that segments the plurality of samples of waveform data, compressed by
said compression processing section, into a plurality of frames to thereby ~~generate frame data,~~
~~wherein said framing section segments the plurality of samples of waveform data into the frames in~~
~~such a manner that a number of bits per sample of the compressed waveform data is variable~~
~~between the frames, but uniform within each of the frames, and wherein the frame data generated by~~
~~said framing section include, in a fixed data size corresponding to one frame, auxiliary information~~
~~that includes compression-related information to be used for decompressing the compressed~~
~~waveform data, and a plurality of samples of the compressed waveform data of the frame form the~~
frames, wherein each of the frames has a fixed total number of bits and includes a fixed auxiliary
information area and a remaining data area, by packing the compressed and segmented waveform
data into the data area and packing compression-related information into the auxiliary information
area, wherein a number of bits per sample of the packed waveform data is uniform within each of
the frames but variable between the frames, and said compression-related information includes
number-of-bits information indicative of said number of bits per sample within the corresponding
one of the frames and decompression parameters to be used for the decompression of said
compressed waveform data in the corresponding one of the frames; and
a writing section that, for each of the frames, writes the frame, ~~data, generated formed by~~
said framing section, ~~into a storage device in accordance with the fixed data-size memory capable of~~
storing n bits per address, over a predetermined number j of successive addresses.

Claim 7 (currently amended): A compressed data structure as claimed in claim 1,
~~wherein suited for segmentation of a plurality of samples of compressed waveform data into~~
~~a plurality of frames and subsequent storage of each of the frames into a memory capable of~~
~~storing n bits per address,~~
~~wherein a number of bits per sample of the compressed waveform data is variable between~~
~~the frames, but uniform within each of the frames,~~
~~each of the frames of the compressed waveform data is stored over a predetermined number j~~
~~of successive addresses of said memory, and~~
~~k samples of the compressed waveform data of the frame are stored at m bits of the n bits~~
~~(where $m < n$) in each of the j addresses~~ of said memory contain said data area, ~~and an auxiliary~~
~~information area storing auxiliary information that includes compression related information to be~~
~~used for decompressing the compressed waveform data is stored at remaining (n-m) bits a~~
remaining "n-m" bits of the n bits in the address j addresses of said memory contain said auxiliary
information area.

Claim 8 (original): A compressed data structure as claimed in claim 7 wherein m is k
times a number of bits i per sample of the compressed waveform data of the frame, where k is an
integral number equal to or greater than one.

Claim 9 (currently amended): A ~~storage device~~ memory storing a plurality of frames
of compressed waveform data having a compressed data structure as defined in claim 7.

Claim 10 (currently amended): A waveform tone generation apparatus comprising: as claimed in claim 4, wherein m bits of the n bits (where $m < n$) in the j addresses of said memory contain said data area, and a remaining "n - m" bits of the n bits in the j addresses of said memory contain said auxiliary information area, and

a storage device as defined in claim 9;

an address generation section that generates, every sampling cycle, a readout address varying at a predetermined rate corresponding to a designated tone pitch;

a readout section that generates a memory address incrementing by one each time the readout address increments by a value, and accesses said storage device with the memory address to thereby read out data of n bits from said storage device;

[[an]] wherein said auxiliary information retrieval section that retrieves the auxiliary information by taking out the data of "n-m" bits the data of (n-m) bits from the data of the n bits, successively read out by said read out section, and to thereby output auxiliary information including compression information;

wherein said compressed waveform data retrieval section further comprises a temporary storage section that retrieves the data of the m bits from the read out data of the n bits and stores the retrieved data of the m bits among the data of n bits, successively read out by said read out section, and said compressed waveform data retrieval section retrieves the samples by taking out each of the samples of compressed waveform data from the data of the m bits stored in said temporary storage section, in accordance with the readout address generated by said address generation section and the number of bits per sample designated by said number-of-bits information; and

a waveform generation section that accesses said temporary storage section with the readout address to thereby sequentially read out k samples of compressed waveform data, performs a decompression process, on the basis of the compression information outputted by said auxiliary information retrieval section and the sequentially read out samples of compressed waveform data, to thereby restore samples of original waveform data, and generates a tone waveform on the basis of the restored samples of original waveform data.

Claim 11 (currently amended): A ~~waveform~~ tone generation apparatus as claimed in claim 10 wherein said temporary storage section is capable of storing one or a plurality of, less than j, the data of the m bits.

Claim 12 (original): A waveform storage processing apparatus comprising:
a storage section having a plurality of addresses each having a data width of n bits;
a segmentation section that segments input waveform data into a plurality of frames;
a compression section that, for each of the frames, performs a compression process on the waveform data to thereby generate compressed waveform data of m/k bits;
an auxiliary information generation section that, for each of the frames, generates auxiliary information including compression information indicative of a form of the compression process performed on the frame;
a to-be-written data formation section that, for each of the frames, forms a predetermined number j of to-be-written data of n bits on the basis of data of m bits formed by retrieving samples of the compressed waveform data, k samples at a time, and data of (n - m) bits sequentially retrieved from the auxiliary information of the frame; and
a writing section that sequentially writes the j to-be-written data, formed for each of the frames, to a predetermined number j of successive addresses of said storage section.

Claims 13-32 (canceled)

Claim 33 (new): A compressed data structure as claimed in claim 1, wherein said compression-related information further includes decompression parameters to be used for the decompression of said compressed waveform in the corresponding one of the frames.

Claim 34 (new): A compressed data structure as claimed in claim 1, wherein said auxiliary information further includes loop addresses to be used for generation of a tone.

Claim 35 (new): A tone generation apparatus as claimed in claim 4, wherein said compression-related information further includes decompression parameters to be used for the decompression of said compressed waveform in the corresponding one of the frames, and said decoding section decompresses each of the samples of the compressed waveform data, using the decompression parameters included in the auxiliary information retrieved by said auxiliary information retrieval section.

Claim 36 (new): A tone generation apparatus as claimed in claim 35, wherein said decompression parameters are parameters created on the basis of compression parameters used in compressing original waveform data to create said compressed waveform data.

Claim 37 (new): A tone generation apparatus as claimed in claim 35, wherein said decompression parameters are loop addresses for repetitively reading out said compressed waveform data.

Claim 38 (new): A tone generation apparatus as claimed in claim 10, wherein said number-of-bits information in the auxiliary information included in one of the frames indicates said number of bits per sample within the next frame.

Claim 39 (new): A tone generation apparatus as claimed in claim 10, wherein said number-of-bits information in the auxiliary information included in one of the frames indicates said number of bits per sample within the one frame.

Claim 40 (new): A tone generation apparatus as claimed in claim 10, wherein said compression-related information further includes decompression parameters to be used for the decompression of said compressed waveform in the corresponding one of the frames, and said decoding section decompresses each of the samples of the compressed waveform data, using the decompression parameters included in the auxiliary information retrieved by said auxiliary information retrieval section.

Claim 41 (new): A tone generation apparatus as claimed in claim 40, wherein the decompression parameters in the auxiliary information included in one of the frames are used for the decompression of at least one sample of the waveform data included in the next frame.

Claim 42 (new): A tone generation apparatus as claimed in claim 40, wherein the decompression parameters in the auxiliary information included in one of the frames are used for the decompression of at least one sample of the waveform data included in the next frame.

Claim 43 (new): A tone generation apparatus as claimed in claim 10, wherein said auxiliary information retrieval section gathers the “n-m” bits of the n bits read out by said readout section during each of the frames and, after completion of the gathering of each of the frames, outputs the thus-gathered auxiliary information.

Claim 44 (new): A tone generation apparatus as claimed in claim 40, wherein said auxiliary information retrieval section gathers the “n-m” bits of the n bits read out by said readout section during a predetermined range in each of the frames and, after completion of the gathering of the range, outputs the thus-gathered decompression parameters.